where α, β, γ, ... are the six different prime factors 2, 3, 5, 7, 31, 61 (with repetition 2 and 5) combined in products of 1, 2, 3, ..., 10 letters at a time.

By actual calculation and checking we have found the following ten solutions:

$x=-3343$, 12721, 320, 305, 7547, -2225, -710, -3215, -8495, -56950;

$y=2$, 8, 29, 374, 4187, -1, -91, -1486, -4276, -29851;

$u=568$, -2634, -116, 454, 5923, $+337$, -126, -2136, -6102, -42446;

$v=-137$, -89, -101, 319, 5473, -141, -261, -2121, -5841, -39941.

Also solved by G. B. M. Zerr.

169. Proposed by R. D. CARMICHAEL, Princeton University.

Let $Q_n(x)=0$ be the equation whose roots are all the primitive nth roots of unity without repetition. In $Q_n(x)=0$ replace x by α/β, a fraction in its lowest terms, and clear of fractions. Let $Q_n(\alpha, \beta)$ represent the resulting first member. Set $n=mp$ where p is the largest prime factor of n. It is required to find all the integral values of α, β, m, p satisfying the following relations:

$$(1)\quad Q_{m}p(\alpha, \beta)=p,$$
$$(2)\quad \alpha^m-\beta^m\equiv 0 \pmod{p}.$$

One such solution is: $\alpha=2$, $\beta=1$, $m=2$, $p=3$. (See MONTHLY, Vol. XII, p. 89.)

[No solution of this problem has been received.]

170. Proposed by PATRICK WALSH, 1451 Annunciation Street, New Orleans, La.

The areas of rectangles A and B are respectively 15170 10/27 and 31230.3627. Find the sides and diagonal of each rectangle in exact or rational numbers.

Solution by B. F. FINKEL, Ph. D.

For A, let x and y be the dimensions of the field. Then

$$xy=15170\tfrac{10}{27}=\frac{2^{14}.5^2}{3^3}\ldots(1), \text{ and } \sqrt{(x^2+y^2)}=d\ldots(2),$$

where d is the diagonal, which is to be rational. Solving (1) for y and substituting the value thus found in (2) and reducing, we have

$$\frac{\sqrt{(3^6x^4+2^{28}.5^4)}}{3^3y}=d.$$

Let $x=\dfrac{2^7.5}{3^2}z$. Then $d=\dfrac{2^7.5}{3^2z}\sqrt{(z^4+9)}$. Let $\sqrt{(z^4+9)}=z^2t-3$. Then $z^2=\dfrac{6t}{t^2-1}$.